Foreground Moving Object Detection using Support Vector Machine (SVM)

M. Nagaraju, M. Baburao

Abstract: ***Detect the existence of an object and to locate it in a video is called object detection. In the process of tracking an object we first segment the given frame and then track its position, motion and occurrence. Before tracking any object the process of object detection and object classification are done. Once we detect any object we have to classify the object into several categories like humans, vehicles, animals etc. There are many applications in which object tracking is being used such as robotics, traffic monitoring, security, video surveillance and animations. In this paper, we proposed a framework to detect the foreground moving object in a video scene at real time. Firstly preprocessing the given video is divided into frames to detect the object. Next morphological filter is used to remove the Nosie after detect the object. In this step, frame is divided into pixels. Here optical flow method is used to segment the given frames. After that, canny edge detector is used to detect the edge of object from segmented image. Finally, classify the object using Support Vector Machine (SVM).***

Keywords : SVM, IQA, Gaussian Filter, Morphology.

I. INTRODUCTION

Video can be defined as sequence of frames which consist of images, where each sequence of image is displayed with very high speed, so that human eye cannot detect the time gap between the frames. The continuity is required because two consecutive frames are closely related. Applications like video surveillance, robotics etc. has a first step for identification of regions of interest (ROI). Although using a general algorithm for object detection is desirable, but it is quite difficult to handle objects having many variations in their colour, shape, size and texture. Mostly computer system uses a fixed still camera and it is used in object detection process much more feasible. Usually, a frame taken from a video sequence is split into two distinct set of pixels, where the second one is complementary to the first one. The first set belongs to the foreground object while the other one belongs to the background objects. The definition of foreground and background objects very much depend on the application being used. Normally, the objects like people, vehicles, and animals etc are considered as a foreground objects and rest of the things are considered as background.

The outline of this is paper is as follows. The Related work is described in section II. The proposed frame work is discussed in section III. Section IV presents the results of the proposed framework. The section V contains the conclusion and future work.

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***** Correspondence Author
First Author Name* M. Nagaraju, Research scholar, CSE, JNTUK, Kakinada, India. Email: melam.nagaraju5810@gmail.com
Second Author M. Baburao,Professor, CSE, Gudlavalleru Engineering College, Gudlavalleru, India.Email: baburaompd@gmail.com

II. RELATED WORK

Real time image is used to detect an object from the video and track it by using the background subtraction method [1]. Tracking is done after pre-processing of video and it is done by using characteristics like: shape, color, size, location in each frame and also discuss the background subtraction method that uses the temporal differencing alpha and the statistical methods. An image, is split into two sets. The first set contains foreground objects data and the second set contains the background data. Lot of time's shadow is recognized as foreground object which gives improper results. The object detection and tracking of an object from the video is used in diverse discipline, artificial intelligence system, transportation system, security of an airport and in railways etc. We take a camera as an input, for capturing video shots. The runtime object is helpful for detecting and tracking of an object from the given frame i.e., based on the background subtraction and dynamic threshold method. It is useful for giving the complete details of the moving object. It is very efficient do detect the moving objects in fast manner for better results in the surveillance system [2]. Background subtraction performs the image subtraction on the given image the contains the moving objects [3]. The motion of feature point's analysis is used to calculate camera ego motion, however they are not used for moving object detection [4].

III. PROPOSED METHOD

The proposed system, the given video is segmented into the frames. Objects are detected from the frames and the noise is removed from the detected objects, so that classification of object can be done.

1. Processing:

In a video scene, digital still camera motion and moving object is responsible for frame difference which represent the motion. It is necessary to reduce this effect from the frame difference. The data movement between the two sequences of images are represented by the following transformation:

$$R' = CR + t$$

Where R and R' represents the data location in the first and second frame. C is Transformation matrix and t is translation vector.

The original image is converted into gray scale image and also from the input channel intensity pixel value is obtained. Then, two consecutive image are split into grid cells. So that we have to check and track each cell in the current frame to find the corresponding cell in the next frame. For this the following method is used:

$$G_{t-1}(m,n) = G_t(m+d_u, j+d_v)$$

Where d_u, d_v are motion distances in u-axis and v-axis respectively.
$G_{t-1}(m,n)$= group of cells in the current frame.
G_t = group of cells in the next frame.
The frame work of the proposed system is show in figure1.

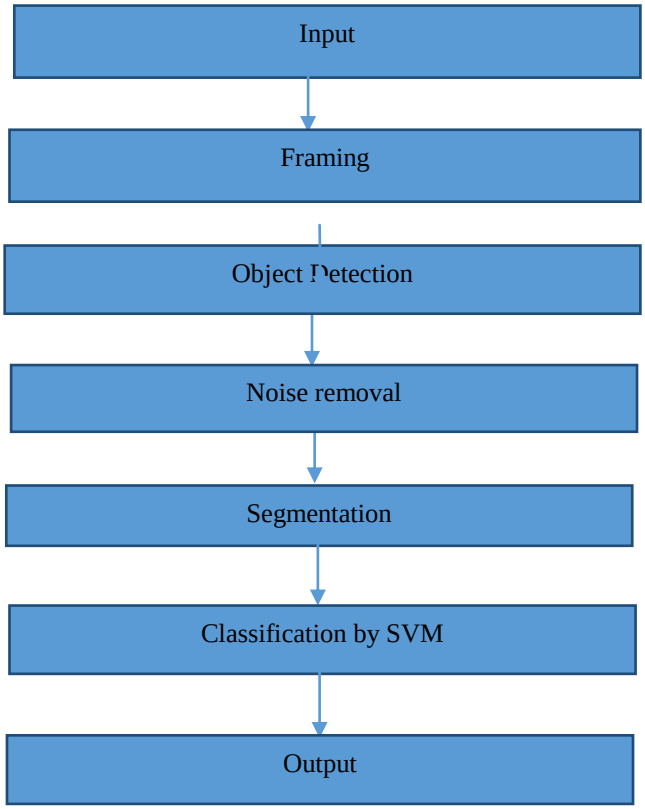


Figure 1: Proposed System Framework

2. **Image Quality Assessment (IQA):**

IQA is one of the process in object detection from a image to measure the image quality, the perceptual quality is used. Which is based on subjective evolution. But, objective metrics also plays an important role for image quality whereas objective metric is based on mathematical measurement. There are number of metrics that are available in objective quality metrics and these metrics are depend on availability of original non-distorted image which is compared with corresponding distorted image. For this we use Structural Similarity Index measure (SSIM). It works with the subjective perception. For SSIM, we have to give the comparison components of images. i.e.

SSIM(u,v) = f(l(u,v),c(u,v),s(u,v))

3. **Remove Noise :**

Here morphological filter is used to remove noise from the background image of an moving object. In this we use a FCH (fuzzy clustering histogram) that is used to reduce the signal of color variation generated by background motion.

4. **Optical Flow Method :**

Optical flow method is used to segment the independent image of video from ego motion that is caused by camera. It is not easy task to segment moving object area, because of 3-D movement of camera within an environment.

5. **Classification of moving object:**

Here SVM method is used for classification. It is a pixel wise classification method. In this we have used a small number of positive and negative samples which are trained by SVM [5]. But, it requires large amount of training samples. So, for this we have also applied Canny Edge Detector Method that is used to increase the accuracy for detection of images.

IV. EXPERIMENTAL RESULTS OF PROPOSED SYSTEM

The proposed system is developed using MATLAB and tested for different types of objects.

Fig (a) Input Image1 (blizzard)

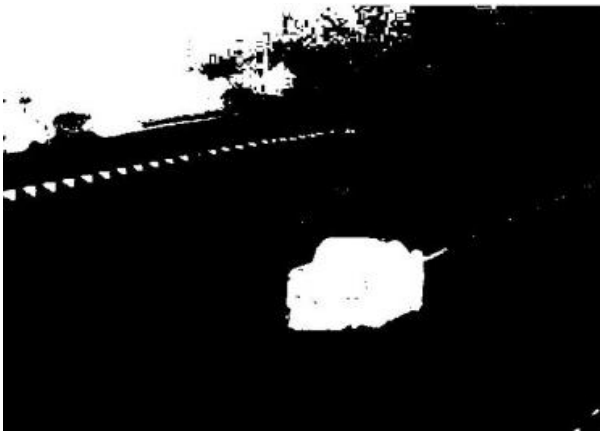
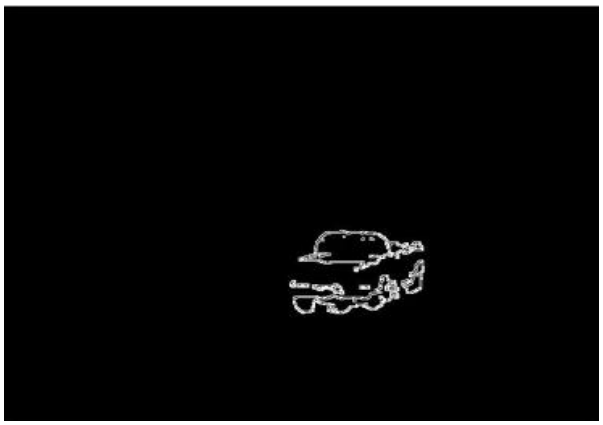


Fig (b): object Detection



Fig(c): Noise Removal

Fig.(d): Output of the final result from SVM Classifier

Fig (a) Input Image2 (skating)

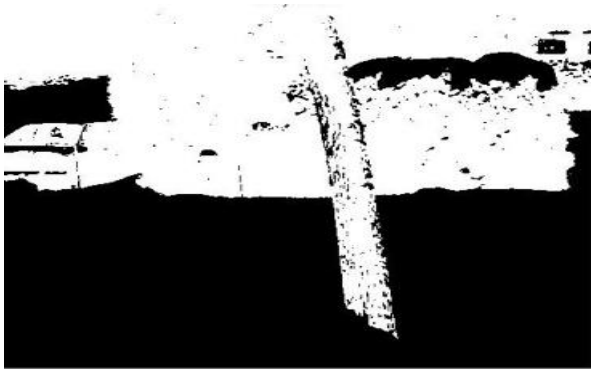
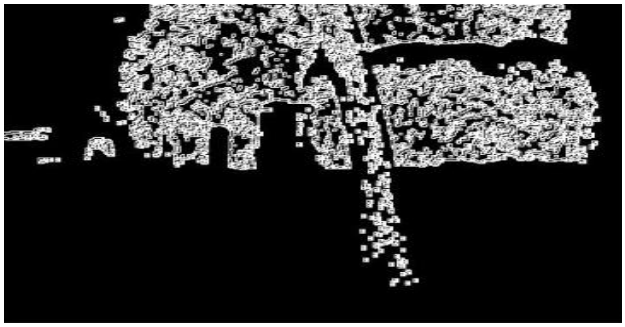
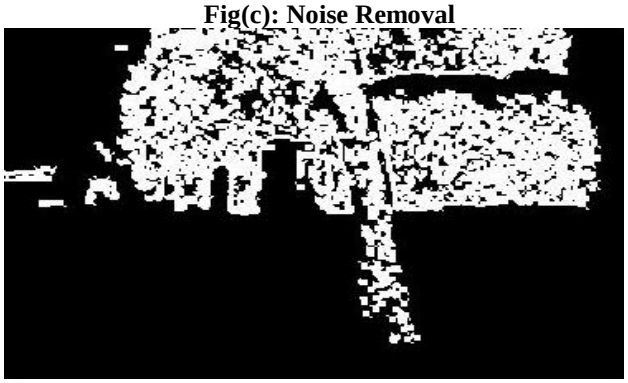


Fig (b): object Detection



Fig(c): Noise Removal



Fig(d): Output of the final result from SVM Classifier

V. CONCLUSION AND FUTURE WORK

The proposed foreground moving object detection using Support Vector Machine (SVM) framework can be used to detect object from video or image. Firstly the given video is split into frames to detect the object. Next morphological filter is used to remove the Nosie after detect the object. In this step, frame is divided into pixels. Here optical flow method is used to segment the given frames. After that, canny edge detector is used to detect the edge of object from segmented image. Finally, classify the object using Support Vector Machine **(SVM).**

In the future, the work of this research can be extended to increase the detection and segmentation accuracy using hybrid self-organizing map (SOM) based Artificial Bee Colony (ABC) optimization. This approach deals with dynamic background and the illumination changes effectively to detect the foreground moving object.

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AUTHORS PROFILE

First Author Mr. M. Nagaraju pursuing Ph.D in Computer Science and Engineering at JNTUK, Kakinada, Andhra Pradesh. He received his M.Tech Degree in Computer Science and Engineering at Gudlavalleru Engineering College, Gudlavalleru in 2011. His areas of interest are Image Processing, Deep Learning, Mobile Computing and Algorithms. He has published 3 papers in International Conferences, 2 papers in National conferences and 12 papers in International Journals.

Second Author Dr. M. Baburao is a professor of Computer Science and Engineering Department at Gudlavalleru Engineering College. He completed Ph.D from JNTUK, Kakinada in 2013. He is a life member in Indian Society for ISTE, IE and institute nominee member in CSI. He published 18 papers in International Journals, 11 papers in international and national conferences. He guided 20 under graduated projects and 10 post graduate projects. Her research interests include Image Processing, Pattern Recognition and Machine Learning.